U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE
SUBCOMMITTEE ON ENVIRONMENT, TECHNOLOGY, AND STANDARDS

HEARING CHARTER

Improving Drought Monitoring and Forecasting: H.R. 5136, the National Integrated Drought Information System Act of 2006
May 4, 2006
10:00 a.m. to 12:00 p.m.
2318 Rayburn House Office Building

Purpose:

On May 4, 2006 at 10:00 a.m., the Subcommittee on Environment, Technology, and Standards of the House Committee on Science will hold a hearing to better understand ways to forecast and predict occurrences of drought, which can have profound economic, social, and environmental impacts, and to receive comments on H.R. 5136, the National Integrated Drought Information System Act of 2006 (See Appendix I for a section-by-section summary of H.R. 5136).

The Committee plans to explore these overarching questions:

1. How does the federal government currently forecast and monitor drought, and what are the major strengths and weaknesses of these systems?

2. What is the proposed National Integrated Drought Information System (NIDIS), and how would it improve the federal government's drought monitoring and forecast efforts?

3. What specific actions are needed to implement NIDIS, including data management, monitoring, and research, and how will H.R. 5136 promote those actions?

Witnesses:

Dr. Chester Koblinsky, Director, Climate Program Office, National Oceanic and Atmospheric Administration.
Mr. Duane Smith, Vice Chair, Western States Water Council; Representative, Western Governors' Association.
Mr. Kenneth Dierschke, President, Texas Farm Bureau.
Mr. Marc D. Waage, P.E., Manager, Raw Water Supply, Denver Water, Denver, Colorado.
Dr. Donald A. Wilhite, Director, National Drought Mitigation Center, University of Nebraska.

Background:

The National Oceanic and Atmospheric Administration (NOAA) estimates that drought results in total economic costs in the U.S. of $6 to $8 billion each year from such impacts as crop loss; premature livestock sales; degraded water quality; decreased tourism revenue from limited rafting, boating, fishing, golfing and skiing; decreased energy generation capacity; increased

ground-water pumping costs; and reduced barge tonnage for commercial shipping. The total cost of particularly severe droughts, including economic impact and government aid to affected communities, has exceeded $60 billion in the past. While drought is not sudden or violent, it can be among the most devastating of natural disasters, and it affects all parts of the country. In every one of the hundred years ending in 1995, some part of the United States has experienced a severe or extreme drought.

Experts in drought mitigation contend that substantial losses due to drought are not inevitable. With adequate prior knowledge of a coming drought, the extent and severity of many impacts can be substantially mitigated. For example, urban water managers can change reservoir release schedules and impose pre-drought water restrictions; agricultural users can alter crop choice and timing of planting to minimize water needs and potential crop loss, including changing crop rotations and use of strategic irrigation techniques; forest managers can alter fire suppression and mitigation plans, including pre-positioning of assets and people, and can heighten public awareness of wildfire prevention needs; waterway managers may be able to plan water releases and dredging activities to maintain open waterways; managers of animal stocks can budget for increased feed costs and can sell excess stock when prices are more favorable; energy providers can manage to reservoir levels and fuel supplies to minimize cost increases due to reduced hydro-power capacity.

Substantial investments by federal, state and local governments have targeted research on and monitoring of droughts. However, these efforts have generally been unconnected and uncoordinated. Many researchers and water users believe that tying together and building upon current drought research and monitoring efforts will result in significant improvements in forecasting of, planning for, and mitigation of drought and its impacts.

NOAA Drought Forecasting and Research Funding History

NOAA spends approximately $10 million annually on drought research, monitoring, and forecasting. However, this amount does not reflect NOAA's indirect investment in drought which includes expenditures on satellites and other tools that provide data and services that support a broad range of climate research, monitoring, and forecasting in addition to drought. Quantifying the total contribution to drought monitoring and forecasting by NOAA and other federal agencies is impractical (and virtually impossible) because of the many programs and data streams that contribute to, or can be utilized in, these efforts.

Before Fiscal Year 2007 (FY07), NOAA's budget did not include a specific request for drought research, monitoring, and mitigation efforts. Beginning in FY07, NOAA is requesting $7.8 million directly in support of the National Integrated Drought Information System (NIDIS). Of this amount, $4.0 million will sponsor research and research-to-operations transition projects and $3.8 million will support monitoring through the Climate Reference Network and improvements in regional observation systems required by NIDIS.

Development of a National Integrated Drought Information System

Experts believe that recent advances in statistical analysis could yield increased objectivity, accuracy and reliability in future drought forecasts. To facilitate development of a more comprehensive, real-time drought information and forecasting system, NOAA collaborated closely with other federal agencies, the Western Governors' Association (WGA) and other stakeholders to identify the drought product needs of state and local users and developed a plan for a National Integrated Drought Information System (NIDIS). The key goals of NIDIS are:

- to expand monitoring and data collection systems to include coordinated, comprehensive coverage of key indicators such as soil moisture and ground water;
- to implement an integrated data collection and dissemination system; and
- to develop effective and useful tools to support analysis and decision making at all levels and geographic scales.

Coordination of monitoring efforts across agencies is expected to lead to more efficient and effective data collection, decreased duplication of effort, and more even and complete monitoring of critical regions. Expanded monitoring will include collection of soil moisture data (soil moisture is currently modeled but only sparsely measured) and more comprehensive ground water measurements.

Also as part of NIDIS, NOAA will develop a web portal as a single point of information for users of drought related information and tools, eliminating the need for water managers to collect data from multiple sites, in multiple formats. Part of the NIDIS plan includes development of new and higher-resolution tools to allow users to more closely examine the drought risk in their state, watershed, and county. NOAA also expects to significantly increase drought forecasting skill through an initiative to statistically re-evaluate drought-related data from the past 100 years. This effort is expected to yield a better understanding of the conditions that lead to drought in all regions of the country, providing information that NOAA scientists can use to improve drought prediction models. NOAA projects that it will take five to six years to fully implement NIDIS with gradual improvement in NOAA's drought monitoring and forecasting capabilities occurring throughout the implementation process.

Weaknesses in Current Federal Drought Monitoring and Forecasts

Water managers, water users, and drought researchers have identified four primary weaknesses in the current drought monitoring and forecast system. First, no mechanism currently exists to comprehensively assess the extent, severity, or impacts of drought throughout the United States. Partly due to the lack of a standard definition of drought, and partly due to the existence of many disparate monitoring efforts, local governments each use different sets of indicators and triggers to determine when a drought occurs. Equally important, there is no comprehensive effort across all levels of government to measure the impacts of drought, leaving decisionmakers in the dark as to the extent and severity of the agricultural, economic, and social consequences of drought.

Second, not all of the data collected by federal programs are delivered in a timely fashion, and in compatible formats. Some of the data come from cooperative programs that require periodic collection and delivery of the data, whereas other data are collected in a continuous manner.

Furthermore, different federal programs use different data formats, making the combination of data from multiple sources difficult.

Third, current drought monitoring and forecast products -- the U.S. Drought Monitor map and U.S. Seasonal Drought Outlook map, both described below -- provide general guidance on current and future drought risk, but are updated infrequently and do not provide fine enough detail to meet the operational needs of most water managers and users. While water managers can use these tools to communicate the state and trends of drought, the maps do not distinguish drought conditions on an individual reservoir or watershed level, which is the level at which water managers need to make operational decisions.

Finally, there is no single coordinating agency that operates a clearinghouse or a prediction model incorporating the drought-related data and tools produced by the many federal, state, and local agencies that work on drought management and collect drought-related information. Current drought forecasts provided by the federal government involve manually collecting data and products from the many federal, state, tribal and local sources, subjectively weighing the value of the many forecast parameters and indices that may influence drought conditions, and manually drawing maps to represent "best estimates" of drought risk throughout the country.

Description of Current National Drought Monitoring and Forecast Products

Beginning in 1999 and 2000, the federal government began providing two major drought products as low-resolution national maps: the Drought Monitor, and the U.S. Seasonal Drought Outlook. Examples of these products are in Appendix II.

The Drought Monitor map (updated weekly at http://www.drought.unl.edu/dm/monitor.html) is an assessment product produced after consultation among scientists at NOAA, USDA, and the University of Nebraska. Published weekly since late 1999, it provides an overview of national-scale trends in drought extent and severity that attempts to synthesize many sources of drought-related information.

In contrast to the Drought Monitor which assess current conditions, the U.S. Seasonal Drought Outlook is a forecast that has been produced since March 2000 by NOAA's National Climate Prediction Center. This monthly map and accompanying information provide a seasonal-scale prediction of general, large-scale drought trends and can be found at: http://www.cpc.noaa.gov/products/expert_assessment/seasonal_drought.html. More details of the Drought Monitor and Seasonal Drought Outlook, and the data and indices on which they are based, are in Appendix III.

Water managers use the Drought Monitor and Seasonal Drought Outlook to communicate with decisionmakers and the public. For example, water management authorities in the Denver area use these maps to help city officials and the public understand the need for water restrictions in municipal areas.

H.R. 5136, the National Integrated Drought Information System

H.R. 5136 was introduced on April 6, 2006 by Mr. Hall and Mr. Mark Udall. The bill establishes NIDIS and designates NOAA as the lead agency. It specifies that NOAA will coordinate with local, state, and federal entities to create a comprehensive network of drought information and provide decision-makers with the tools to manage water resources. A section-by-section summary of H.R.5136 is in Appendix I.

At a hearing by the Senate Committee on Commerce, Science and Transportation on April 27, witnesses and Members expressed support for H.R. 5136, including an endorsement by NOAA of the authorized spending levels.

Witness Questions:
The witnesses were asked to address the following questions in their testimony.

Dr. Chester Koblinsky, Director, Climate Program Office, National Oceanic and Atmospheric Administration.

1. Please describe the drought monitoring and forecasting information currently provided by NOAA and other federal agencies.
2. What are the major components of NIDIS and what specific actions are needed to fully implement NIDIS? In particular, what is the timing of these actions and the budget needs to implement the program?
3. How would the proposed National Integrated Drought Information System (NIDIS) improve the quality and usefulness of the drought monitoring and forecasting information provided by the federal government?
4. Please provide specific comments on H.R. 5136, the National Integrated Drought Information System Act of 2006.

Mr. Duane Smith, Vice Chair, Western States Water Council; Representative, Western Governors' Association

1. What are the major strengths and weaknesses of drought monitoring and forecasting information currently provided by the National Oceanic and Atmospheric Administration and other federal agencies? How do states use this information to inform water resource management decisions?
2. How would the proposed National Integrated Drought Information System (NIDIS) improve the quality and usefulness of the drought monitoring and forecasting information provided by the federal government?
3. Please provide specific comments on H.R. 5136, the National Integrated Drought Information System Act of 2006.

Mr. Kenneth Dierschke, President, Texas Farm Bureau.

1. What are the major strengths and weaknesses of drought monitoring and forecasting information currently provided by the National Oceanic and Atmospheric Administration and other federal agencies? How does the Texas agricultural community use this information?

2. How would the proposed National Integrated Drought Information System (NIDIS) improve the quality and usefulness of the drought monitoring and forecasting information provided by the federal government?
3. Please provide specific comments on H.R. 5136, the National Integrated Drought Information System Act of 2006.

Mr. Marc D. Waage, P.E., Manager, Raw Water Supply, Denver Water, Denver, Colorado.

1. What are the major strengths and weaknesses of drought monitoring and forecasting information currently provided by the National Oceanic and Atmospheric Administration and other federal agencies? How do you use this information to inform water resource management decisions?
2. How would the proposed National Integrated Drought Information System (NIDIS) improve the quality and usefulness of the drought monitoring and forecasting information provided by the federal government?
3. Please provide specific comments on H.R. 5136, the National Integrated Drought Information System Act of 2006.

Dr. Donald A. Wilhite, Director, National Drought Mitigation Center, University of Nebraska.

1. Please describe the drought monitoring and forecasting information currently provided by NOAA, other federal agencies and the National Drought Mitigation Center. Also, please describe the functions of the National Drought Mitigation Center and how it differs from the proposed National Integrated Drought Information System (NIDIS).
2. How would the NIDIS improve the quality and usefulness of the drought monitoring and forecasting information provided by the federal government?
3. What are the major data management, monitoring and research components of NIDIS and what specific actions are needed to fully implement those components?
4. Please provide specific comments on H.R. 5136, the National Integrated Drought Information System Act of 2006.

Appendix I: Section-by-Section Summary of H.R. 5136, the National Integrated Drought Information System Act

Section 1. Short Title.
National Integrated Drought Information System Act of 2006.

Section 2. Definitions.
Defines two terms: 1) "drought" means a deficiency in precipitation that leads to a deficiency in surface or subsurface water supplies and that causes (or may cause) substantial economic or social impacts or physical damage or injury to people, property, or the environment; 2) "Under Secretary" means the Under Secretary of Commerce for Oceans and Atmosphere.

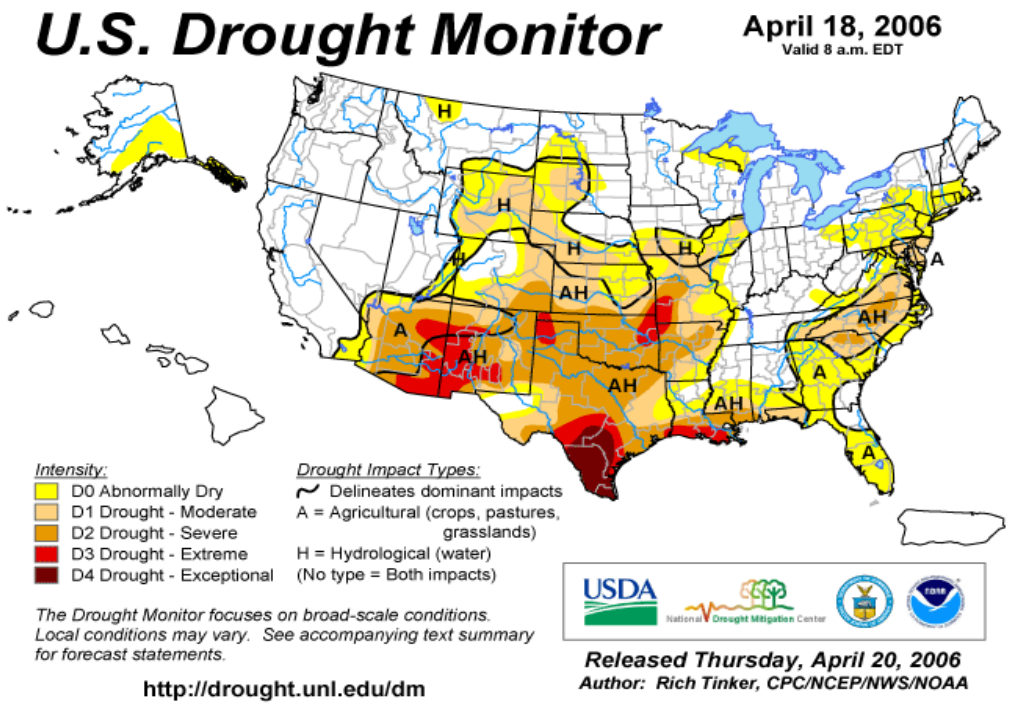
Section 3. NIDIS Program.
Directs the Under Secretary to establish the National Integrated Drought Information System (NIDIS) through the National Weather Service and other appropriate programs in NOAA.

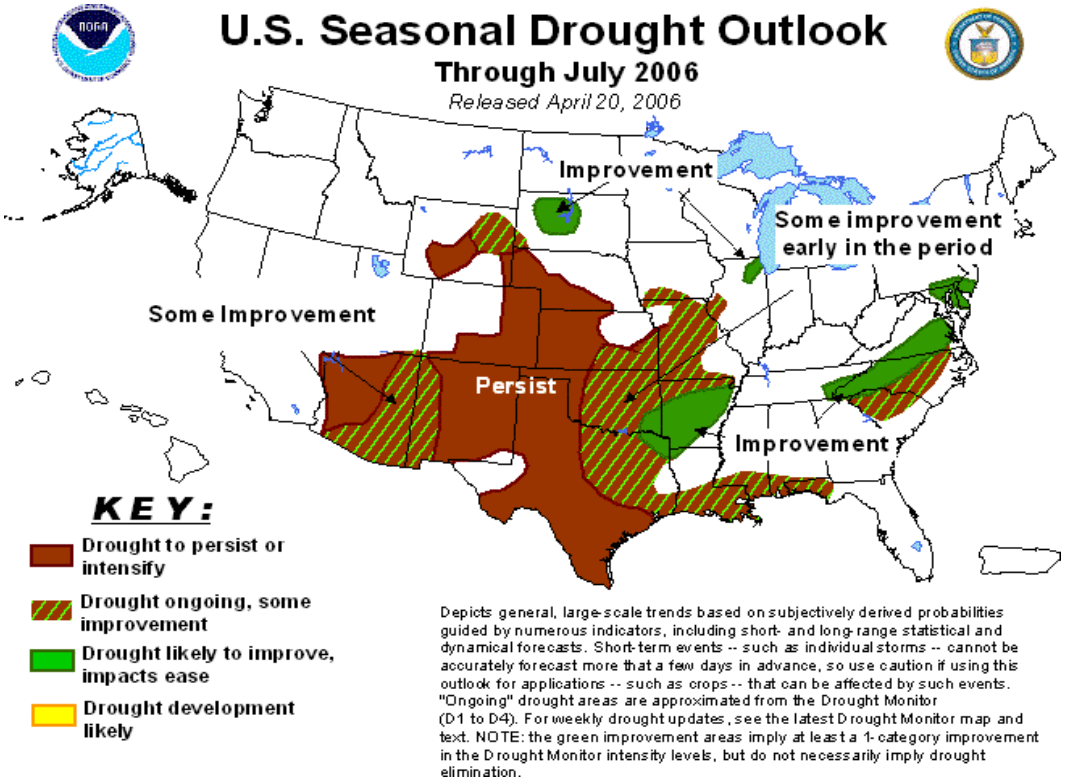
Specifies that the system shall provide an effective drought early warning system and shall coordinate and integrate Federal research in support of the system. Specifies that NIDIS: be a comprehensive system that collects and integrates information on drought for useable, reliable, and timely drought assessments and forecasts; communicate forecasts, conditions and impacts to the public and private sectors, and decisionmakers at all levels of government in order to aid timely, informed decisions leading to reduced impacts and costs; include timely and real-time information and products reflecting local, regional, and State differences in drought conditions.

Directs the Under Secretary to consult with relevant Federal, regional, State, tribal and local agencies, institutions, and the private sector in the development of NIDIS. Requires each Federal agency to cooperate with the Under Secretary as appropriate in carrying out the Act.

Section 4. Authorization of Appropriations.
Authorizes $12 million for FY07, $14 million for FY08, $16 million for each of FY09 and FY10, and $18 million for each of FY11 and FY12.

Appendix II: Drought Monitor and Seasonal Drought Forecast Maps





Appendix III: Definitions and Assessments of Drought

The American Meteorological Society's Glossary of Meteorology (1959) defines drought as "a period of abnormally dry weather sufficiently prolonged for the lack of water to cause serious hydrologic imbalance in the affected area". In lay terms, a drought is an abnormally long period of dry weather that causes serious problems such as crop damage and/or water supply shortages. As stated by NOAA, drought can be defined in one of four ways:

(1) Meteorological: refers to a situation when precipitation is below normal levels for that region.
(2) Agricultural: refers to a situation where the amount of moisture in the soil no longer meets the needs of a particular crop.
(3) Hydrological: refers to a situation when surface and subsurface water supplies are below normal.
(4) Socioeconomic: refers to the situation that occurs when physical water shortages begin to affect people.

The U.S. has engaged in quantitative monitoring of drought for over 40 years. The Palmer Drought Severity Index (PSDI), developed in 1965, was the first attempt to comprehensively quantify drought in the U.S. The most widely used of the drought indices, it incorporates temperature and rainfall information and is considered effective at monitoring the development of long-term droughts in regions that do not rely on snowpack for water. However, the PSDI is severely limited in its ability to identify fast-developing events.

In order to fill the need for monitoring fast-developing agricultural drought, experts developed the Crop Moisture Index (CMI) in the late 1960s. The CMI places greater emphasis on recent measurements and is therefore considered much more effective at monitoring fast-developing droughts but is considered ineffective in the context of long-term droughts because it only incorporates short-term water availability information.

In the 1980s and 1990s, new indices were developed to help monitor drought in individual basins (the Surface Water Supply Index) and to help track the impact of precipitation on the different components of the hydrological cycle (the Standardized Precipitation Index). Each of these indices must be calculated for different regions and conditions, and no single index meets the needs of all users.

Assessment of drought draws on a variety of environmental data, some of which are collected explicitly to monitor drought, and some of which are collected for multiple needs. Drought-related monitoring has grown to include numerous federal agencies: the U.S. Department of Agriculture (USDA) manages snow pack information; the Army Corps of Engineers and U.S. Bureau of Reclamation manage reservoir storage data; NOAA manages hydroclimatic data (i.e., precipitation and other weather-related data, including satellite data); the U.S. Geological Survey (USGS) manages ground water and stream flow information; and NOAA and the Environmental Protection Agency work with states and tribes to manage various water quality programs.

All of this information is used to develop the U.S. Seasonal Drought Outlook and the weekly Drought Monitor described in the main text of this charter. The Drought Monitor uses these categories to described drought conditions:

Category	Description	Possible Impacts
D0	Abnormally Dry	Going into drought: short-term dryness slowing planting, growth of crops or pastures; fire risk above average. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered.
D1	Moderate Drought	Some damage to crops, pastures; fire risk high; streams, reservoirs, or wells low, some water shortages developing or imminent, voluntary water use restrictions requested.
D2	Severe Drought	Crop or pasture losses likely; fire risk very high; water shortages common; water restrictions imposed.
D3	Extreme Drought	Major crop/pasture losses; extreme fire danger; widespread water shortages or restrictions.
D4	Exceptional Drought	Exceptional and widespread crop/pasture losses; exceptional fire risk; shortages of water in reservoirs, streams, and wells, creating water emergencies.